# The Corona PC

*An IBM PC-compatible desktop machine that features a high-quality display and the Multimate word-processing program*

**by Rich Malloy**

One thing that continues to amaze me in this industry is the number and variety of microcomputers claiming compatibility with the IBM Personal Computer (PC). Like siblings, these machines share a common theme yet retain an individual character and personality.

The Columbia MPC (Multipersonal Computer) could be the older brother, content to copy his father exactly. The Compaq becomes the proper and dependable sister with a weakness for travel. And, of course, the Eagle PC is the younger brother who has a penchant for tidiness—he keeps the keyboard under his bed.

Then comes Corona (photo 1): the younger sister who reveals tremendous artistic ability and perfect penmanship. While family members settle for simple stick-figure drawings, she spends hours producing intricate and precise drawings. And her free spirit makes her more at home in Fortune 1000 companies than in the Fortune 100, although she would be useful in any office.

The Corona PC is a cream-colored desktop personal computer that is about 90 percent compatible with the IBM PC. In fact, its major incompatibility is also one of its best features—a high-density, high-contrast graphics screen. Its other departure from the IBM PC is its price, $2995 for a system with two floppy-disk drives (320K bytes each), 128K bytes of memory, serial and parallel interfaces, and a medium-size software bundle (MS-DOS, a BASIC interpreter, PC-Tutor, and a word processor). (See At a Glance box for more information.) The equivalent configuration from IBM costs about $1000 more.

The Corona should work fairly well in any office where an IBM PC might be found, especially for word-processing applications. When new applications software takes advantage of the Corona's high-quality graphics, this machine's capabilities will really stand out. Like any new computer, it has a few knots and rough edges, but nothing the experienced computer user cannot adjust to.

## Hardware

Physically, the Corona resembles the IBM PC. It takes up about the same space on your desk and is just as heavy when you try moving it to another office. Its disk drives remain true to IBM's, horizontal and on the right side of the unit.

One obvious difference is the position of the Corona's on/off switch. Corona subscribes to a common yet curious school of thought that holds that this important switch should be in the most inaccessible place possible—the back panel. Thus, turning the Corona on requires a prerequisite minute or so while your fingers fumble around for the switch.

While fumbling, however, you discover something handy—a reset switch. The IBM PC and most of its clones use a combination of the Alternate, Control, and Delete keys to trigger a reset that can be deactivated by software. The result is that when certain software packages "hang up," you have to turn the machine off, wait 10 seconds, turn it on, and wait a minute while the computer checks its memory. On the Corona, you simply hit the Reset button on the back panel. This button is not easy to find, and it has a light touch. I usually just flap my fingers around the back for a second or so until I hear the disk drives start up.

## The Display

The Corona's major attraction is its display. This display has good resolution (640 by 325 pixels) and extremely good contrast: it reminds me of the Victor 9000. (By the way, the display arrived here in a box from the

## At a Glance

**Name**
Corona PC

**Manufacturer**
Corona Data Systems
31324 Via Colinas, Suite 110
Westlake Village, CA 91362

**Components**
Size: 19 by 17 by 18 inches (including monitor). Processor: 8088, 16 bit, 5 MHz. Memory: 128K bytes (expandable to 512K bytes). Display: green-phosphor, 80 by 25 characters, IBM PC-style character set. Characters can be underlined, reverse video, high intensity, or blinking. Graphics format: 640 by 325 pixels, two colors (black and green). Keyboard: 83 keys, modified IBM PC-style key layout, 10 function keys, numeric keypad. Mass storage: one 320K-byte floppy-disk drive. Optional second floppy-disk drive or 10-megabyte hard-disk drive. Interfaces: parallel-printer port and RS-232C serial port. Expansion: four IBM PC-style expansion slots.

**Software**
MS-DOS version 1.25 operating system, GW BASIC interpreter, Multimate word-processing program, PC-Tutor

**Options**
Second floppy-disk drive: $450; extra memory modules, 128K bytes each: $295; 10-megabyte hard-disk drive: $2295

**Documentation**
Four loose-leaf binders, approximately 150 pages each, 5½- by 8½-inch pages

**Price**

| | |
|---|---|
| With one floppy-disk drive: | $2595 |
| With two floppy-disk drives: | $2995 |
| With one floppy-disk drive and one 10-megabyte hard-disk drive: | $4495 |

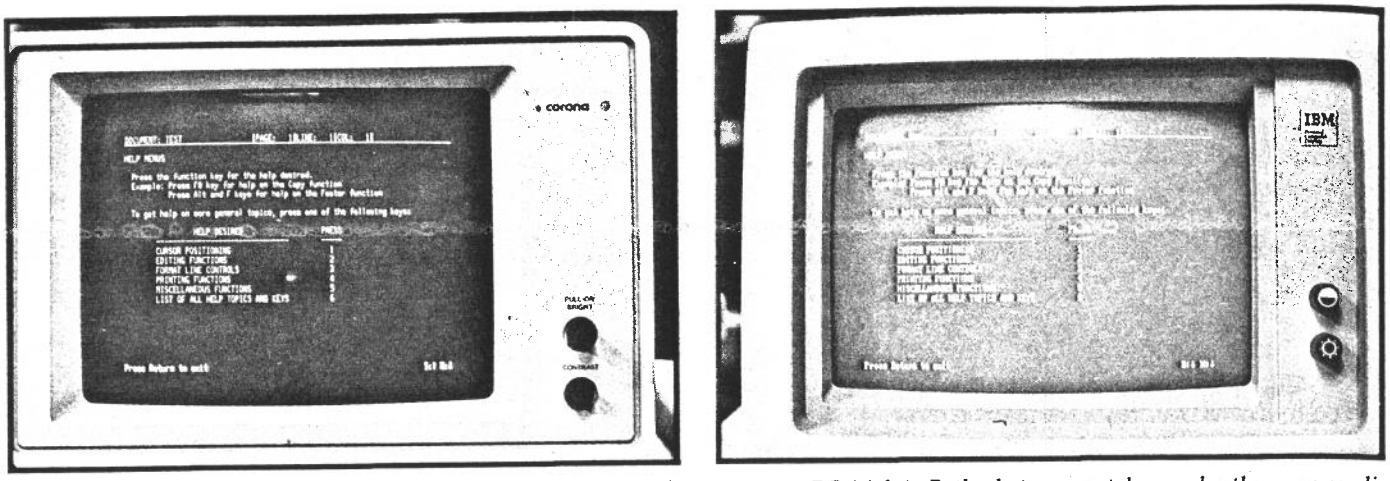


**Photo 2:** *The display screen of the Corona (left) compared with that of the IBM PC (right). Both photos were taken under the same conditions. Note the Corona's increased contrast and the IBM's well-formed characters.*

Amdek company.) Photo 2 compares the display with that of the IBM PC.

The people at Corona claim that the true resolution of their display is a whopping 1280 by 325 pixels (picture elements). You can't access these 1280 pixels directly (i.e., through BASIC), but the Corona's character generator seems to use them, with the result that the Corona's character set is smooth and practically free of "jaggies."

In character mode, the Corona PC varies in only one way from the IBM PC. It features the same 80-line by 25-character layout, the same attributes for each character (reverse video, underline, high intensity), and the same variety of characters (see photo 3). The one exception involves formation of the individual characters. Each character occupies a matrix that is 16 pixels wide by 13 pixels high. Yes, that's 16 pixels wide. At first I thought this was inaccurate, but I took out my magnifying loupe, which I use for software warranties and license agreements, and sure enough they were right. Each pixel is about half as wide as it is high. The lowercase "y" is made up of at least 11 pixels from left to right (see photo 4). Add some pixels for the spaces between characters and you get 16.

You might think that with that many pixels to play with, the Corona would have a superb design for each character. But the Corona's characters do not seem to take full advantage of their high-density pixel grid. I think that the character font used by the IBM PC monochrome monitor is more readable than the one Corona uses. The Corona font looks like the IBM font would look after being on a diet for a few weeks.

One of the nice things about the IBM font is that it is richly decorated with serifs, little pen marks that have been helping us distinguish characters for hundreds of years. Corona probably chose to use a thin, sans-serif style to be modern, and I can live with it if I have to. On the Corona's high-contrast screen, any font is OK. But if the company ever came out with a plug-in chip that would generate a font similar to the IBM's, I'd be first in line to buy it.

While the character mode of the Corona's display is functionally (if not visually) compatible with the IBM, in graphics mode the display takes a sharply divergent path. The IBM Color Graphics Adapter card gives the IBM PC three graphics modes; the highest resolution is 640 by 200. The Corona, however, offers only one graphics mode, in black and white, with about 50 percent more

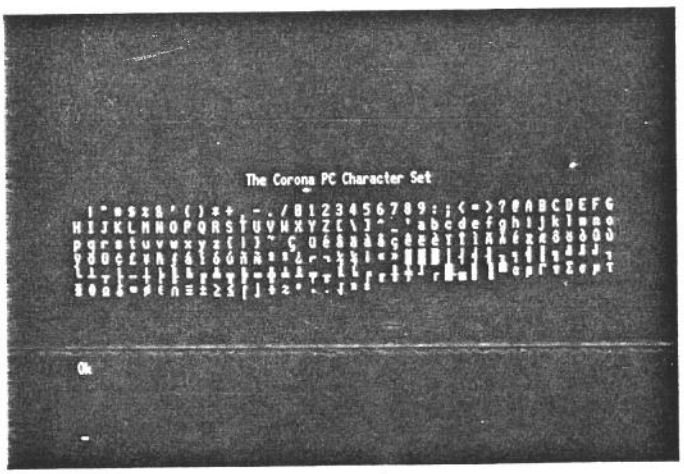


**Photo 3:** *The character set of the Corona PC. The Corona has the same variety of characters as the IBM PC.*

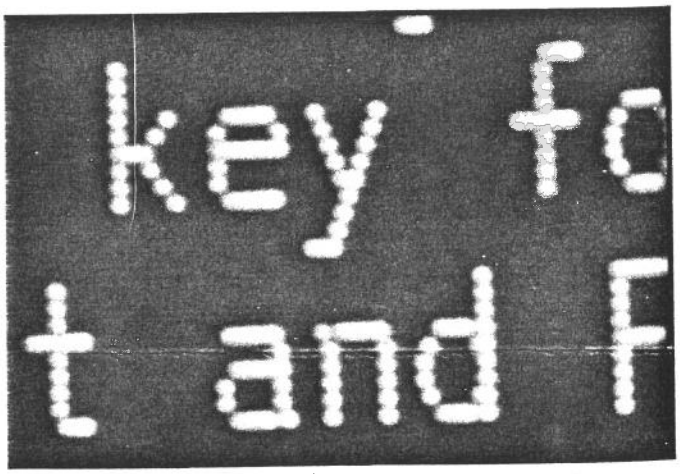

**Photo 4:** *A close-up view of the characters on the Corona's display Note the large number of pixels that form each letter.*

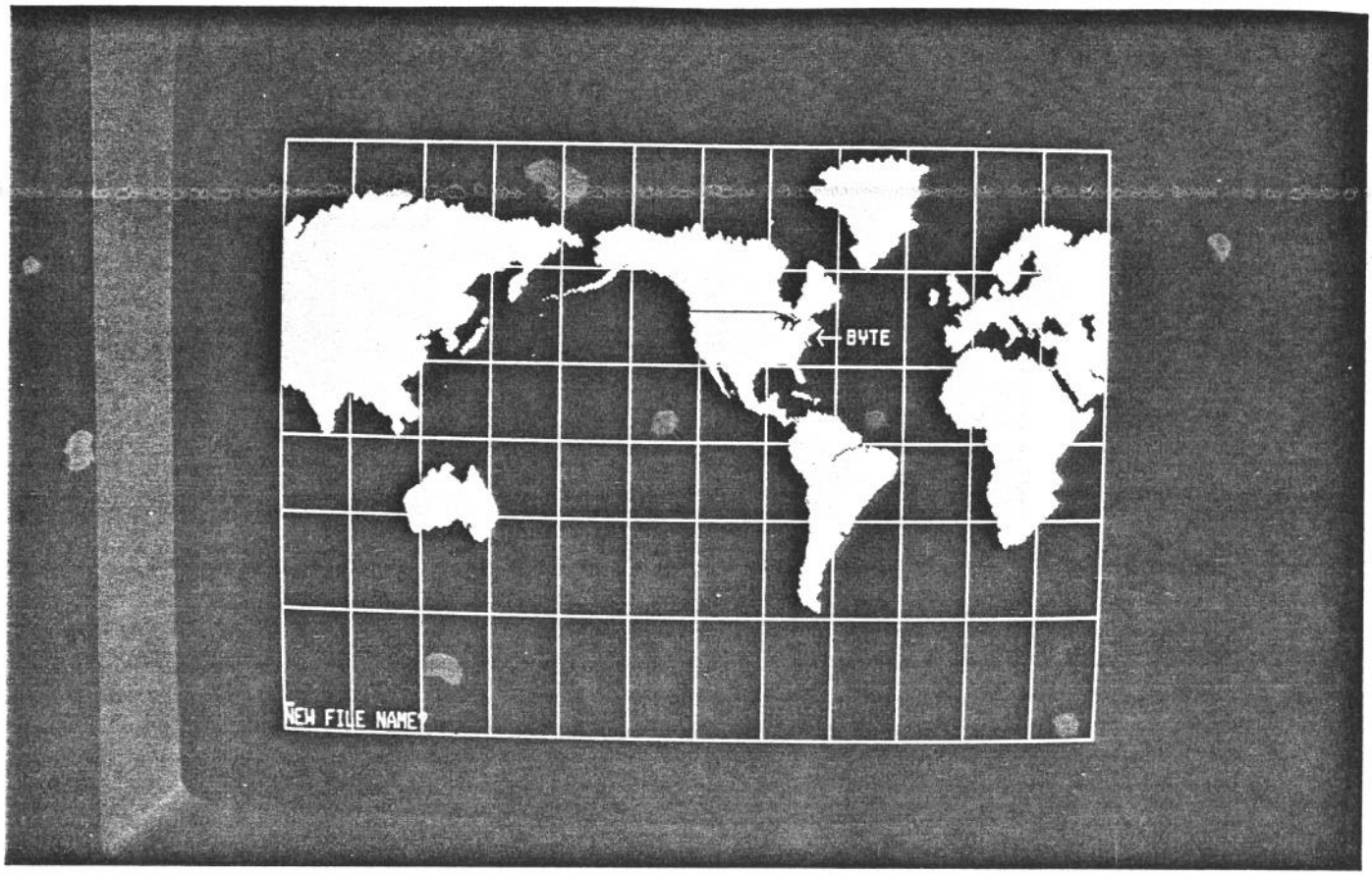


**Photo 5:** *An example of the graphics capabilities of the Corona, this picture was produced by a BASIC program called Etch. The resolution of the screen here is 640 by 325 pixels.*

pixels (640 by 325) than the IBM has (see photo 5). The Corona has better resolution, but it pays for this by not being compatible with the graphics software for the IBM.

Fortunately, this incompatibility problem with IBM's graphics can be solved in any of three ways. First, you can install an IBM Color Graphics Adapter card into the Corona (just as you would have to with the IBM PC) and purchase a color monitor, and your machine will be completely compatible with any graphics program for the IBM. Second, you can wait until the popular software houses modify their programs so that they can run directly on the Corona. Or third, you can wait until the GSX graphics interpreter for the CP/M-86 operating systems becomes readily available. This interpreter is intended to eliminate all graphics incompatibility from one computer to another or from one peripheral to another. Admittedly, the last two alternatives are a bit chancy. The important thing to remember is that if there is any problem, you can install the IBM graphics board.

I should note that on the Corona's display, graphics and characters can by intermixed anywhere on the screen. Also, graphics information can be stored in several places in memory. An advanced programmer can quickly switch from place to place in memory and set up some fast-moving images.

In BASIC, you can individually address any pixel in a 640 by 325 pixel grid, but only two colors are supported: black and white (actually green). As mentioned previously, the real resolution of the screen is 1280 by 325, so each addressable pixel is actually made up of two smaller pixels. Advanced programmers may be able to individually address each of the these smaller pixels.

## The Keyboard

The Corona, like many of the IBM compatibles, uses a keyboard produced by Key Tronic in Washington. Visually, it is almost an exact duplicate of the IBM keyboard (see photo 6). It has the same 83 keys, including 10 function keys, a combination cursor-control/numeric keypad, and keys such as Num Lock, Scroll Lock, and PrtSc. Functionally, it has a similar keyboard processor and type-ahead buffer, but it is lighter, quieter, and has its own indicator lights for the Caps Lock and Num Lock keys.

Key Tronic offers two key layouts for this keyboard. One is an exact duplicate of the controversial key layout used by the IBM PC. The other is a more traditional (i.e., sensible) layout with the left Shift key and the Return key in their usual positions. Corona was originally going to use the exact IBM key layout, but it received so many requests for the traditional layout that it has now switched to that keyboard.

In "The Corona Portable PC" (September 1983 BYTE, page 226), I mentioned that the keyboard on the Corona Portable was one of the best I had seen. It was. But that keyboard had the Shift keys and Return keys in the



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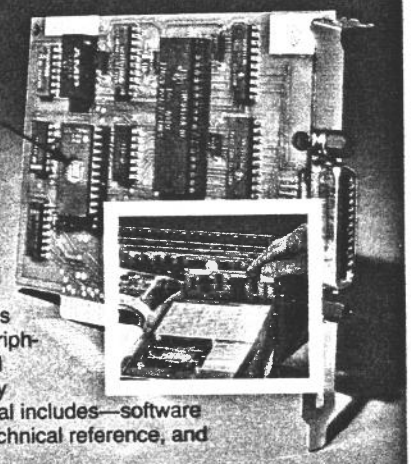

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right places. Unfortunately, the keyboard we received with the desktop Corona had the exact IBM key layout, and it was a bit harder to use. Not only were the keys in nonstandard places, but some of the keys had very light touches. For example, I must have a tendency to rest my index finger on the J key because "j" kept appearing in strange places.

No doubt you can grow accustomed to this keyboard, but after three weeks of heavy use, my error rate was still about twice what it was with my old IBM Selectric.

Of course, it's difficult to be objective about keyboards. Everyone has preferences. In fact, some people really *like* the IBM PC key layout. I prefer the Corona with the more traditional keyboard. And I'd prefer a slightly heavier touch.

## The Processor

Like the IBM PC, the Corona is built around the 16-bit 8088 microprocessor with a clock speed of 5 MHz. Having this processor, of course, doesn't guarantee compatibility with the IBM PC, but it's a good start. Also, the slightly higher clock speed of this processor means that the Corona will be about 5 percent faster than the IBM PC.

## Memory

The most significant thing about the Corona's memory is that you can put up to 512K bytes of RAM (random-access read/write memory) chips directly on the main board; you don't need to tie up any of the expansion slots. Also, the Corona comes with software that enables you to partition part of this memory as a RAM disk.

The standard Corona comes with 128K bytes of memory, a reasonable amount. The unit I used had 256K bytes with 128K bytes of this configured as a RAM disk. I didn't run out of memory, but I didn't run any huge spreadsheets, either.

One nice thing about the Corona is that it doesn't spend a minute checking all of the memory each time you turn on the machine. This should save about 10 hours of time over the life of the machine. The rationale for this is that even if the machine were to find a bad memory chip, it is better to have a machine that works partially than a machine that won't let you work at all. Just in case, Corona provides a nice memory-test program that graphically tells you which chip is bad.

## Power Supply

The Corona power supply provides 110 watts (W) compared to the 64 W supplied by the IBM PC. The additional supply in the Corona enables you to add internal peripherals such as a hard disk without fear of overloading the machine.

## Floppy-Disk Drives

The standard unit comes with one 320K-byte floppy-disk drive. There is room for another floppy or for a hard disk. The floppy disks use a standard configuration for double-sided double-density disks under MS-DOS ver-


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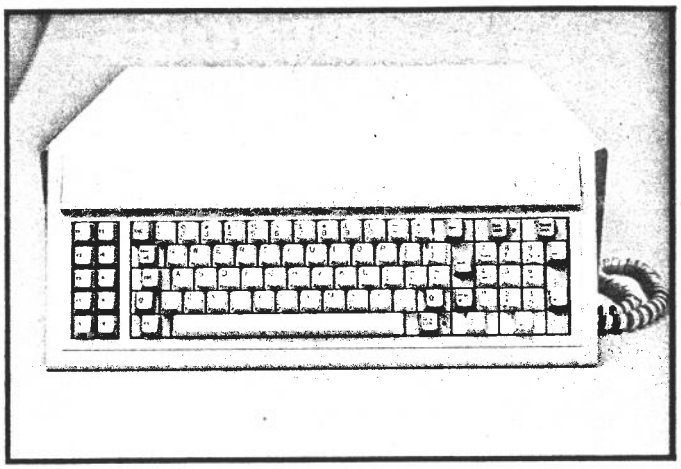

**Photo 6:** *The Corona's keyboard, which was produced by Key Tronic. Again, note the similarity to that of the IBM. Also note that future editions of the Corona will have some keys repositioned, specifically the left Shift key and the Return key.*

sion 1.25. When MS-DOS 2.00 becomes available for the Corona, you should be able to put 360K bytes on each disk.

The only difference I've noticed between the Corona floppy-disk drives and those of the IBM is that the Corona drives are quieter, though not as quiet as those of the Compaq.

## Interfaces

It's been about a year since I've heard of a new computer that does *not* come standard with both a Centronics parallel-printer port and a serial RS-232C port. Progressive thinking such as this is much welcomed.

The Corona is no exception to this forward trend. The circuitry for both of these interfaces is right on the main circuit board. The connectors for these interfaces are on the back panel (see photo 7). I've used the parallel port with an Epson MX-80 printer and had no problem with it. The serial RS-232C port, however, is more difficult.

Part of the problem is that the RS-232C standard is itself difficult. According to the standard, the whole world is divided into two parts: data-terminal equipment (DTE) and data-communications equipment (DCE). The important thing to remember is that DTEs can talk only with DCEs, and vice versa. Almost all modems are naturally configured as DCEs, and most microcomputers are configured as terminals or DTEs. Serial printers, however, can't seem to make up their minds. Some are DTEs, some are DCEs.

The Corona is one of the few computers that enable you to configure it as either a DTE or a DCE. Theoretically, you could set up the machine as a DTE to have an easy connection with a modem (DCE), or you could set it up as a DCE to connect with any other computer (DTE), or as either of the above to connect with a serial printer (DTE or DCE). The problem in doing this is that to change the configuration you must remove the top cover of the system unit, pull out a jumper (which looks like a memory chip and is very hard to reach), and insert it into another socket.

With this jumper in the modem socket, I could easily connect a Hayes Smartmodem to the Corona. And with

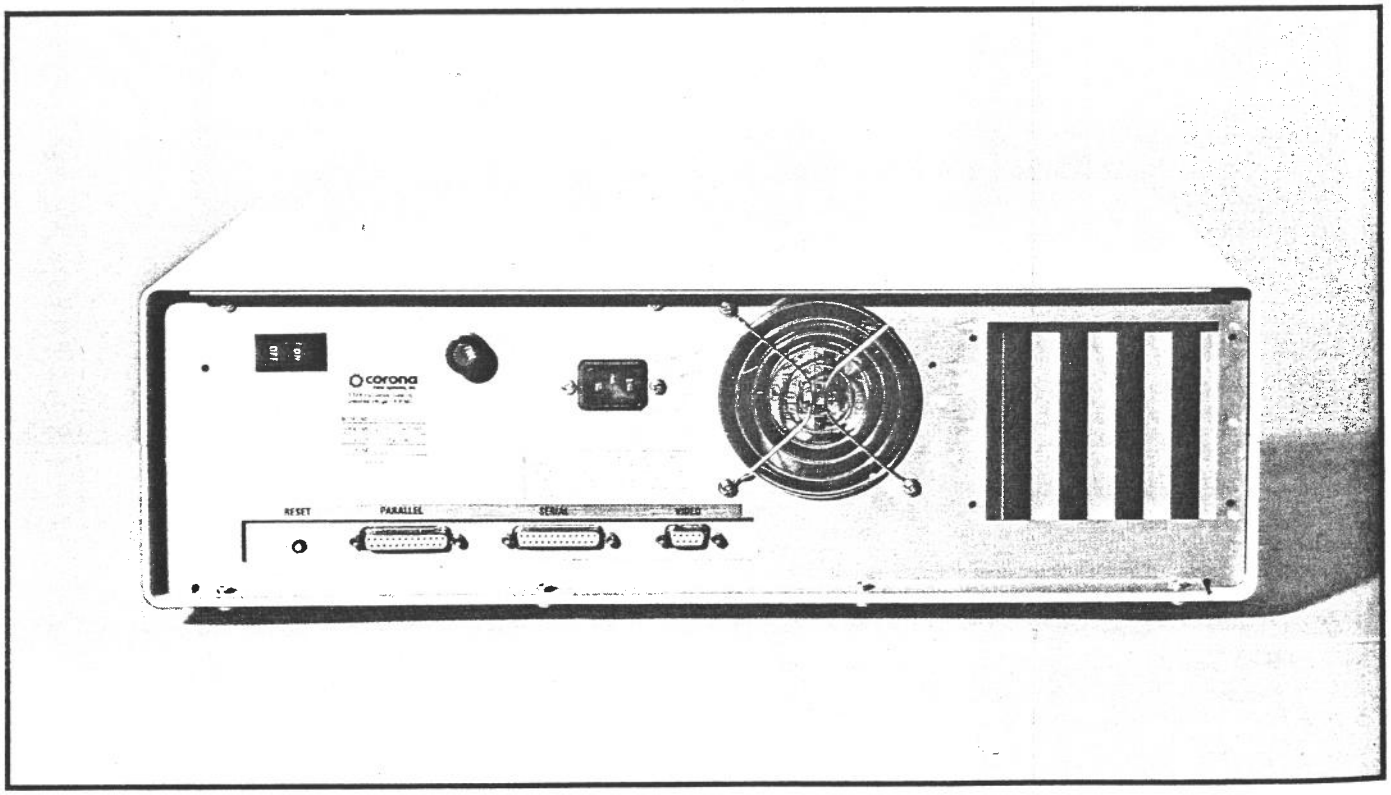


**Photo 7:** *The back panel of the Corona. Note the Reset switch on the left, the parallel-printer port, the serial port, the video-display port, and the openings for the expansion cards.*



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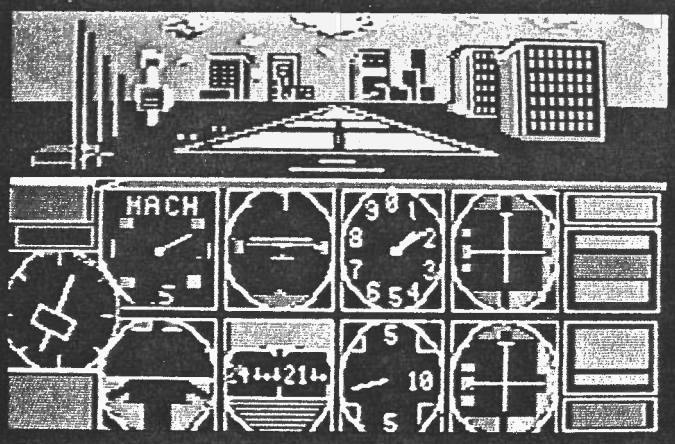

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the jumper in the printer socket, I could easily connect a Diablo 1640 daisy-wheel printer.

But while these hardware connections were satisfactory, the software for them seemed a bit hard to use. For example, I had a hard time trying to access the modem port from BASIC. A popular communications program in BASIC called PC-Talk also had trouble using the modem port. When I connected a serial printer, I was able to access it through BASIC, but I had a little trouble using it with a word processor. These seem to be minor bugs, which I hope will be fixed soon.

## Peripherals

The unit we received from Corona included a pleasant surprise: a 10-megabyte hard-disk drive. This disk drive, which up until recently was Corona's major product, is impressive. Its list price is $2295, and I've seen ads offering the drive at a much lower price.

The hard disk can be subdivided into one, two, three, or four parts. You can easily designate the size of each part. The instructions for formatting and loading the disk, however, are a bit less than ideal; you have to execute a series of four programs. (A simple batch file that would execute these four programs automatically would have been helpful.) But once you have the procedure ironed out, it is fairly straightforward. The actual formatting of the disk takes only about 6 minutes.

Overall, the hard disk was a pleasure to use. Disk-access times for the hard disk were usually fairly fast (although some individual accesses can be as slow as that of a floppy disk), and the storage capacity is huge. In fact, a few weeks with a hard disk can spoil you for systems that have only floppy disks. But the hard disk's seemingly bottomless pit of storage capacity has a price. You must be sure that everything on that disk is backed up on floppy disks. Hard-disk errors are not rare. And a 10-megabyte hard-disk drive will require at least 30 floppy disks to back it up.

## Expansion Slots

The Corona comes with four expansion slots that should accommodate any board built for the IBM (see photo 8). The IBM Color Graphics Adapter board works fine, but I had some trouble with QuadRAM's Quadboard because it is incompatible with the Corona's hard disk.

Note that the IBM PC with capabilities similar to that of the standard Corona may have only one slot left open.

## Software

Some personal computers, such as the Columbia MPC, come with a complete assortment of software. Some, such as the IBM PC itself, come with the bare minimum—a BASIC interpreter. The Corona lies somewhere in the middle.

Like the IBM, the Corona has a BASIC interpreter (GW BASIC from Microsoft). It also features the MS-DOS operating system (version 1.25), a word-processing program patterned after Wang's dedicated word processors,


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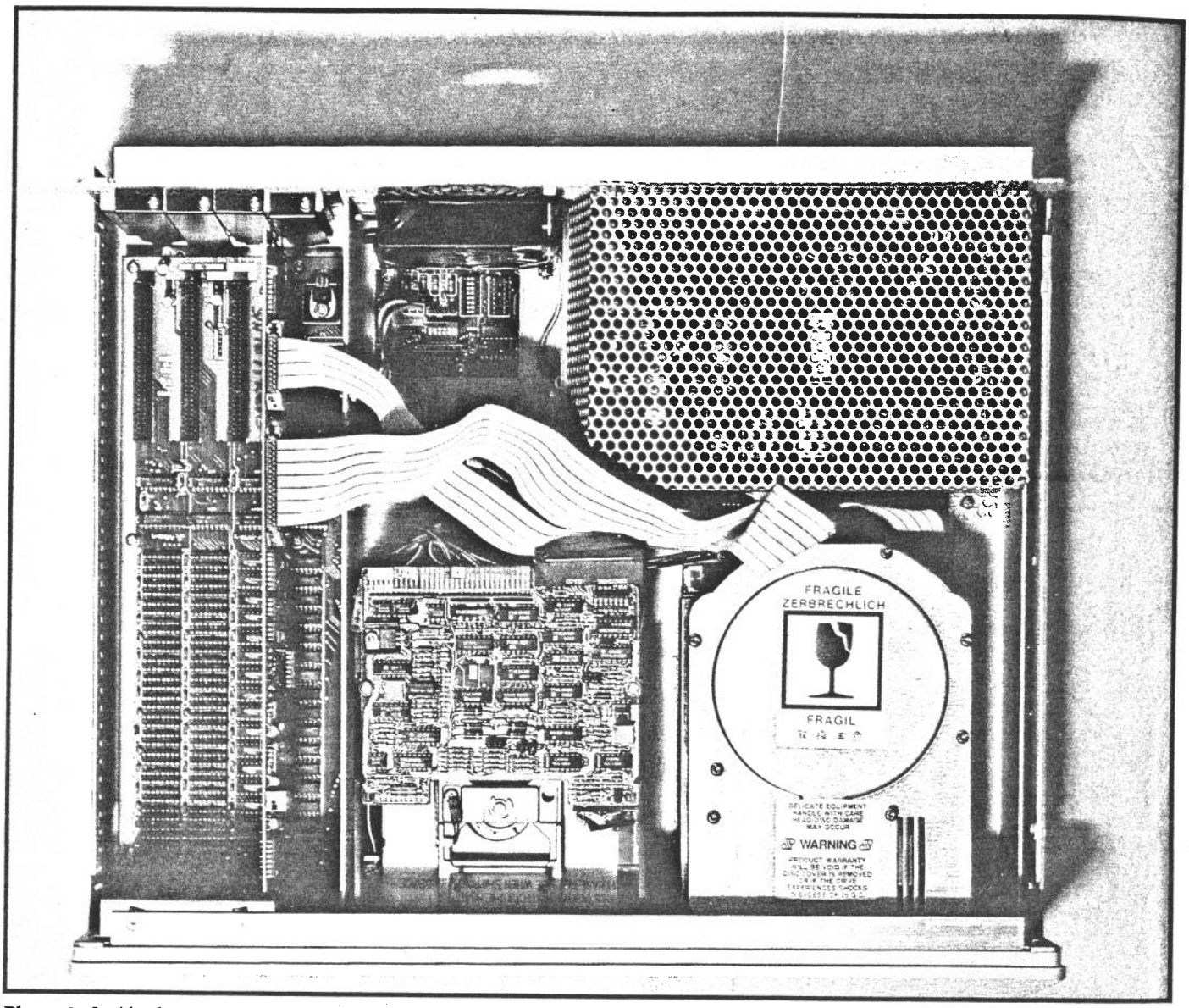


**Photo 8:** *Inside the Corona. A Seagate hard-disk drive is on the lower right and the expansion slots are on the left. One of the slots is taken up by the hard-disk controller. The power supply is on the upper right.*

and a teaching program to guide you through the intricacies of MS-DOS.

## MS-DOS

Despite assertions to the contrary, PC-DOS and MS-DOS are not the same thing, although they are extremely close. Moreover, MS-DOS seems to vary from machine to machine. It is true that all MS-DOS machines can read each other's disks, and they can use most of the same MS-DOS utility programs. But there are some differences.

For example, in PC-DOS you can create batch files by using the COPY command to "copy" a file from the keyboard (which is referred to as "CON:") to a batch file. On the Corona, you call the keyboard "CON," without the color.

As I mentioned before, the Corona's version of MS-DOS also seems to have trouble handling the serial port with the Mode utility program. But perhaps this will be only a temporary problem.

## Multimate

This relatively new word processor from Softword Systems of East Hartford, Connecticut, was designed as a "professional" word processor for the IBM PC. The word "professional" here means that it is supposed to be similiar to the Wang word processors. When, I wonder, will things come full circle and someone design a word-processing program for the IBM PC based on the IBM Displaywriter?

Multimate for the Corona does not seem to be too different from Multimate for any other MS-DOS machine. But because some impressive claims have been made for it and it is a rather impressive package, I will take some time to describe it here.

Multimate is a fairly powerful and fast system. Among its noteworthy features are the abilities to merge letter files with address files, to spool your printing jobs into a queue that can be printed in the background, to do decimal tabs, to perform column arithmetic, and to move columns. In addition, you can save your preferred tab

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| BASIC Benchmark | Time (seconds) Corona | IBM PC | IBM XT |
|---|---|---|---|
| 5000 loops | 6 | 7 | 7 |
| 5000 divisions | 19 | 24 | 24 |
| 5000 GOSUBs | 11 | 13 | 13 |
| 5000 MID$s | 23 | 24 | 24 |
| Sieve program (1 iteration) | 185 | 192 | 192 |
| Disk write (64K bytes) | | | |
| Floppy | 30 | 31 | 29 |
| Winchester | 14 | — | 8 |
| Disk read (64K bytes) | | | |
| Floppy | 22 | 22 | 23 |
| Winchester | 7 | — | 8 |

**Table 1:** *A comparison of the Corona PC with the IBM PC and PC XT using BASIC. Note the slight advantage of the Corona, but the relatively slow speed of its Winchester disk-write routine. The Corona used GW BASIC running under MS-DOS version 1.25 on a 5-MHz 8088 microprocessor. The IBM PC used BASICA (version 1.1) under PC-DOS version 1.1 on a standard 4.77-MHz processor. The IBM PC XT was running under PC-DOS version 2.00. For a listing of the programs, see January 1982 BYTE, page 54.*

stops, right margin, and printer instructions in default files, which will automatically be inserted into all of your subsequent documents.

Multimate is also fairly easy to use, but it does have some problems. It has so many capabilities that you may have a hard time remembering which keys do what. Some keys have four separate functions. You have to keep a key chart handy at all times.

Also, the program has some minor inconsistencies. In some parts of the program you execute a task by pressing the Return key; in others you must press the F10 key (which attempts to act as Wang's Execute key). In some parts you can delete a character by pressing the Delete key or the Minus key; in others you have to press the Backspace key. And though you can delete characters to the right, you can't delete characters to the left.

A problem that is not minor is a utility program called Fileconv. This is supposed to convert Multimate text files to regular ASCII (American National Standard Code for Information Interchange) format and vice versa. It's necessary because Multimate uses some non-ASCII characters (i.e., characters with codes greater than the decimal number 127; see photo 9). Multimate also requires space for a screen of file information (e.g., author, title, comments, and date created) and format lines, which indicate tab stops and right margins. This conversion program, however, works only 50 percent of the time. The rest of the time it crashes the system.

Here at BYTE, with our mosaic of computer and typesetting systems, such a program is very important. A given document may pass through three different computers. If a document cannot be reliably passed to or retrieved from a given word processor, then that word processor has limited use. Multimate's Fileconv program as it now stands seems to have been an afterthought. I hope Softword will have a better program out soon.


Circle 107 on inquiry card.

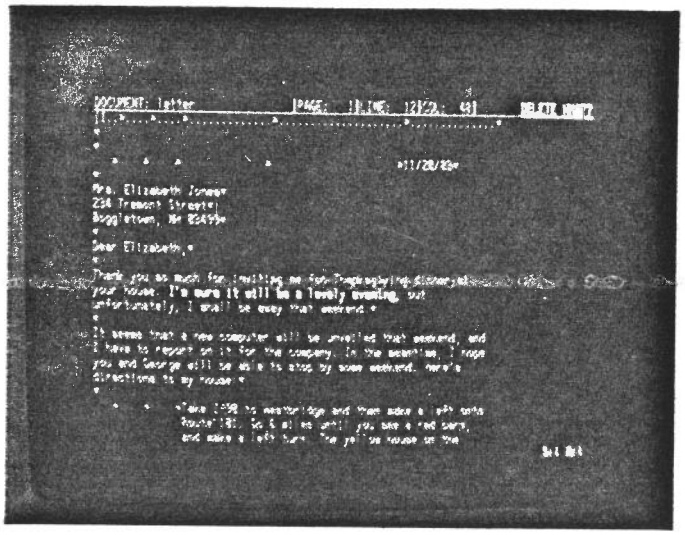

**Photo 9:** *An example of a document being edited by the Multimate word processor. Note the format line at the top of the screen and the non-ASCII characters to indicate tab stops, carriage returns, and indents. Also note the highlighted area that is to be deleted.*

## GW BASIC

The Corona's BASIC interpreter is similar to that of the IBM PC. The major difference is the graphics commands, which are geared to the Corona's unique graphics format.

Almost all of the features I tried worked satisfactorily, but I did find two problems. First, when I was editing a BASIC program using the full-screen editor, the system would on occasion mysteriously hang up.

Second, as mentioned earlier, I had trouble getting the BASIC interpreter to access the serial port. In the GW BASIC manual, Corona supplies a 50-line BASIC program to allow you to use the Corona as a communications terminal. This program looks good, except that it contains a few mistakes. And even when the mistakes are corrected, the program does not work. A mysterious "Device I/O Error" message occurs at certain places. The only way to get the program to work was to trap these errors with an ON ERROR ... RESUME sequence.

As for performance, some standard BYTE benchmarks (see table 1) indicated that the Corona was slightly faster than the IBM PC and XT, faster in fact than the difference in processor speeds might suggest.

## PC-TUTOR

This program is designed to lead you through MS-DOS in a painless but tedious manner. This is an interesting program, but beware: you may learn more than you ever wanted to know about things like MS-DOS's "kludgey" line editor called Edlin.

## Compatibility

I ran a number of IBM PC programs on the Corona. Almost all of them (including Visicalc, Wordstar, and 1-2-3 from Lotus Development Corporation) worked without any problems. The only one that didn't was a telecommunications program (PC/Intercom) that accessed the IBM PC's monochrome display memo directly. If the IBM Color Graphics Adapter had bee installed, even this program would probably hav worked.

Of course, if your application depends on a specif IBM software package, be sure to test it on the Coron before you buy either.

## Documentation

Once again, Corona emulates the IBM. Four book with pages approximately the same size as those in IBI manuals, are included: one for GW BASIC, one for MS DOS, one for Multimate, and one for operatin instructions.

The documentation is fairly comprehensive, but it ha a few minor errors. It is, however, undergoing con tinuous evolution.

The Multimate manual and the operating instructior are fairly straightforward. The manuals for GW BASI and MS-DOS are more difficult. I wouldn't hand thes to a new user.

## The Manufacturer

Corona was founded approximately two years ago b Robert Harp, who was one of the founders of Vecto Graphic, an early microcomputer manufacturer. Vecto Graphic historically has leaned toward larger persona computers, and Corona, with its emphasis on hard disk and husky power supplies, seems to follow that trend

Corona has just recently begun shipping its portabl computer, which is almost identical to its PC (see "Th Corona Portable PC," September BYTE, page 226). Re lease of this machine was held up because of problem with its plastic case.

Corona has told us that in the near future it will offe a "professional" computer with a bit more power tha the PC. Corona will also be offering another graphic format, 640 by 400 pixels, which will be compatible wit the IBM's format of 640 by 200 pixels.

## Summary

The Corona PC is a good, reasonably priced IBM PC compatible computer. As a new machine from a relative ly new company, it has a number of inevitable bugs an inconsistencies. If you have the expertise to iron ou these bugs or the patience to wait for fixes to come out then the Corona may be a good way to save some money For offices that already have an IBM PC, the Corona rep resents a good way to add extra computing power at minimal cost. Also, if a high-contrast, high-resolution display screen is important to you, then give the Cor ona some thought—but wait until some good softwar for this display arrives. Fortunately, this machine' graphics are so good that it should readily attrac graphics programmers. The wait should not be too long at all. ■

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